The Observer
NATIONAL GEODETIC SURVEY
April-June 2003

NGS Measures Elevations in Louisiana

-By Nikki Case

An aerial view of Highway 23 in Plaquemines Parish, LA.

On June 11-20, NOAA's National Geodetic Survey measured the road and levees along Highway 23 in Plaquemines Parish, Louisiana. The survey will help to determine how much Highway 23 has subsided, or sunk. Last fall, NOAA and the NOAA-funded Louisiana Spatial Reference Center (LSRC), located at Louisiana State University, measured the subsidence rate of Highway 1 in Louisiana; the data from this study indicate that portions of coastal Louisiana could lose up to one foot of elevation over the next decade.

NGS, in collaboration with the Corps of Engineers, the Department of Transportation and Development, Louisiana State University, the Louisiana State Police, and the Plaquemines Parish Government, held static Global Positioning System observations, tying a network of benchmarks along the Highway to the National Water Level Observation Network (NWLON) station at Grand Isle.

As the only long-term tide and water level station in Louisiana run by the Center for Operational Oceanographic Products and Services (CO-OPS), this station monitors sea level rise and tells how

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fast elevation moves relative to a specific vertical datum. By making survey ties between benchmarks at the Grand Isle tide station to the tidal gage and the geodetic datum, and then subtracting out the estimated rates of global sea level rise, the rate of change can be found.

After the data is processed, extremely accurate information on the elevation of Highway 23 and the rate of its subsidence will be available. This means that officials can better predict when roads will flood and when evacuation needs to occur.

For a region like Plaquemines Parish, up-to-date information about water and land levels is vital for the safety of residents. The Parish, located at the most southeastern tip of Louisiana, is surrounded on three sides by the Gulf of Mexico and divided by the Mississippi River. Highway 23 is the main hurricane evacuation route for the region, and flooding may mean the loss of property, industry, and life if appropriate emergency preparedness plans are not put into place.

Kendall Fancher and Mark Eckl take GPS observations.

Roy Dokka, director of LSRC, points out that with the estimates, simple calculation shows when places like Plaquemines Parish are going to be at sea level. "By putting this data in a reference frame, you can compare present-day elevations with past elevations and calculate the rate of change. And some areas locally are sinking faster than others. You just want to make sure you are not on the wrong side of the road when flooding begins."

NGS is also working with NOAA's National Weather Service (NWS) to mitigate the effect of storms and flooding on the environment. NWS has been using two new real-time water level stations in St. Charles Parish that CO-OPS established last year in order to help improve their storm surge models. Ultimately, a Digital Elevation Model (DEM) will be generated from the subsidence survey and can be used to assist with design, construction, and engineering of new marsh surfaces.

In April, NGS participated in a press conference about subsidence held in conjunction with the National Hurricane Conference in New Orleans, LA. Admiral Lautenbacher spoke at the press conference and highlighted how much subsidence affects the communities of southern Louisiana. "A majority of Louisiana's population now lives in southern Louisiana. Ongoing subsidence brings this growing population within direct contact with coastal storms and hurricanes," said Lautenbacher. "Through NOAA's National Geodetic Survey, we're able to collect the data on the rate of the subsidence and assess the situation."

Geodetic Leveling and HARN in the Commonwealth of the Northern Mariana Islands

-By Ed Carlson

On May 5, NGS started work on a High Accuracy Reference Network (HARN) and geodetic leveling project in the Commonwealth of the Northern Mariana Islands on the islands of Saipan, Tinian, and Rota. The HARN survey and geodetic leveling campaign will provide the horizontal and vertical integration and positional improvements required to support the diversity of GIS, engineering, geophysical, and charting and mapping applications required within NOS, other Federal, state and local government agencies, and the private sector.

GPS Operations and Training

Using the specifications consistent with the NGS Height Modernization initiative, NGS will conduct an integrated survey program to provide positional accuracies better than 1 cm in the horizontal and 2 cm in the ellipsoid height components.

The tasks to be accomplished are:

1. Increase the densification by implementing a HARN / Cooperative Base Network (CBN) on all the islands; NGS is using existing stations on Saipan, Tinian, and Rota.

2. Conduct geodetic leveling between the tidal benchmarks, Federal Base Network, and HARN stations. The island of Saipan is about 64kms, Tinian is about 43kms, and Rota is about 22 kms wide.

Leveling

3. Host education and training workshops on leveling and on GPS observations on Sapian, Tinian, and Rota.

This project is scheduled to be completed on July 29, 2003, and is being accomplished in cooperation with the Commonwealth of the Northern Mariana Islands, Department of Lands and Natural Resources, Commonwealth of the Northern Mariana Islands Coastal Resources Management, NOS Coastal Service Center, and NOS Pacific Services Center.

GPS Observations

NGS Topographic LIDAR Survey in Alaska

Brad Kearse and Mike Aslaksen take GPS observations.

- By Mike Aslaksen

Between May 12-24, NOAA's Citation aircraft, in collaboration with the NOAA Ship Rainier, acquired LIDAR (Light Detection and Ranging) data along the shoreline of Kruzof Island and the western shore of Baranof Island in Alaska. The data will be used as an initial development of standards and specifications for the use of Topographic LIDAR technology to meet the shoreline mapping needs of NOAA's Coastal Mapping Program (CMP). Extraction of new shoreline and features will be done by establishing a direct relationship between the GRS80 ellipsoid (NAD83) and the local tidal datums of Mean Higher Water (MHW) and Mean Lower Low Water (MLLW) by performing static GPS occupations on the Tidal Bench Marks and using OPUS. Once determined, the ellipsoidal equivalents to MHW and MLLW are then auto extracted from the LIDAR derived terrain data. In Sitka the ellipsoidal equivalents for MHW was determined to be 3.320 m and for MLLW 0.529 m. Three separate flights of LIDAR were collected on May 16, 17, and 18; in all cases, the requirements were for the flight to coincide with the times of lowest low water so as to expose most of the shoreline, alongshore rocks, and features. In both cases the data were processed and shorelines were extracted in the same day. This marks a huge step forward in delivering shoreline to NGS customers versus our traditional product derived from tide coordinated photogrammetry, which might take several months to collect and process. While LIDAR data does not have the capability to classify the shoreline as well as tide coordinated photogrammetry, it is another valuable tool that NGS is actively pursuing to support the CMP.

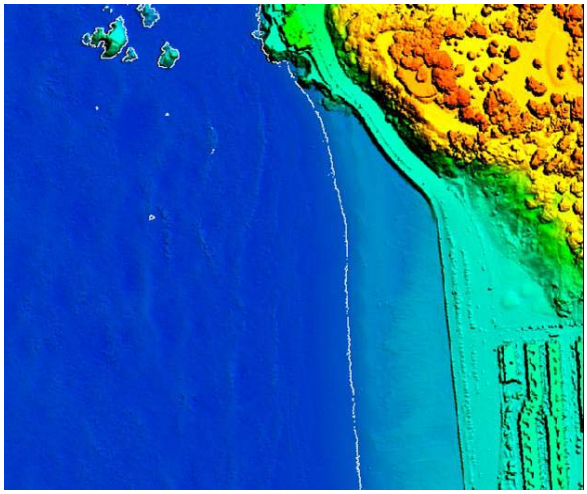
Brad Kearse and John Longenecker with the NOAA Citation and Mt. Edgecumbe in background.

NGS Explores Shoreline Mapping Methods

San Francisco outer coast

-By Jason Woolard

The Remote Sensing Division (RSD) has ongoing research in the San Francisco area to test the feasibility of using airborne LIght Detection and Ranging (LIDAR) and the VDatum transformation tool for shoreline mapping. The method used today by RSD to delineate the shoreline is stereo photogrammetry using tide-coordinated aerial photography controlled by kinematic Global Positioning System (GPS) techniques. Technological advancements in geodetic positioning and airborne remote sensing have led RSD to explore new methods of shoreline mapping.



Shaded relief LIDAR image of San Francisco outer coast.

In October of 2002, the NOAA Citation crew acquired three tide-coordinated LIDAR datasets at the San Francisco study site. In addition to the LIDAR data,

The shoreline in blue is compiled from a NOAA stereo image; the shoreline in green is derived with LIDAR and VDatum.

tide-coordinated aerial photography was collected to coincide with the mean high water (MHW) flight, along with photo identifiable ground GPS control. The purpose of the experiment is to quantitatively compare LIDAR derived shoreline using VDatum to shoreline compiled using traditional photogrammetric techniques. The aero-triangulation and photo compilation has been completed and reviewed by the RSD Applications Branch; comparisons to the LIDAR shoreline are underway.

NGS Gives Presentations in Palau

On March 9-14, Ed Carlson and Dave Doyle attended the first Western Pacific GPS/GIS conference in Koror, Palau. There was representation from the most senior surveying and mapping personnel from nine countries and U.S. territories, including: American Samoa, Guam, Northern Marianas, Philippines, Kosare, Marshall Islands, Palau, Pohnpei, and Yap. Carlson gave a presentation detailing the major activities of NGS and Doyle gave a workshop on the fundamentals of geodesy with Dr. Jim Reilly, recently retired from New Mexico State University. The presentations were well received and at least two countries, Pohnpei and the Marshall Islands, want to explore support for modernization of their national frameworks. In addition to the presentations, Carlson and Doyle also discovered that the Palau Survey/GIS office has an operational CORS that was installed by the Tokyo University Earthquake Center, but no one had ever trained the office on how to incorporate CORS into their own data collection programs. After the conference, Carlson performed some GPS work to quality check the Ikonos imagery for NOS and trained some of the Palau survey staff to more effectively use base stations. Miranda Chin is already in contact with the survey office to try and include the site in both the NGS CORS and IGS networks. The President of Palau, Mr. Tommy Remengesau, and Mr. Fritz Koshiba, Minister of Resources and Development, also met with Carlson and Doyle during the week. Both are very knowledgeable about the important role that GIS is playing in the economic development of their country (Minister Koshiba was previously the Chief of the Survey Office) which relies almost fully on ecotourism.

The photo point for a quality check of the Ikonos at Carp Island

Personnel from the Palau Survey/GIS office occupying a control station MAGACHIN.

Concerning NGS' future role with the countries represented at the conference, Doyle comments, "I think there is an opportunity to create partnerships that can have a positive impact on both the development of the individual countries and the wide range of NOAA scientific interests."

NGS Dedicates Commemorative Marker at Harpers Ferry

Commemorative Marker at Harpers Ferry.

-By Nikki Case

As he prepared to travel into the unknown West in 1803, Captain Meriweather Lewis relied on the U.S. Armory and Arsenal at Harpers Ferry, West Virginia, to provide hardware and supplies for what is now known as the Lewis and Clark Expedition.

Over the next three years, NGS, in partnership with the National Park Service (NPS), will celebrate Lewis and Clark's industry and discovery with a series of commemorative geodetic survey markers set at signature sites along the Lewis and Clark National Historic Trail. On April 12, NGS dedicated the second marker in this series at Harpers Ferry.

"Setting the mark at Harpers Ferry is a chance to make a connection with the history that happened when Meriweather Lewis stopped there and got equipment to outfit his group to prepare for the exploration," said NGS Director Charlie Challstrom.

During the dedication ceremony, Challstrom presented Todd Bolton, NPS ranger at Harpers Ferry, with a small replica of the marker. Bolton responded, "This marker provides a really exciting opportunity to tell the Meriweather Lewis story at Harpers Ferry. By showing the marker, we can talk about navigation 200 years ago and today."

On the value of the project, Challstrom notes, "These markers will raise the public's awareness of the value of accurate positioning; the series will give us a chance to highlight some of the positioning activities that happen in our daily lives, such as property boundaries and safe landing at airports."

Charlie Challstrom at the Harpers Ferry dedication ceremony.

The first marker in the series was dedicated at Thomas Jefferson's home at Monticello, near Charlottesville, Virginia, during the kick-off celebration of the Lewis and Clark Expedition in January.

NGS currently has plans to place markers at 14 more signature sites along the Lewis and Clark National Historic Trail. The next dedication ceremony will take place at the Falls of the Ohio over the weekend of October 24-26, 2003.

NGS Team Receives NOAA Administrator's Award

Last week, George Frank, Douglas Graham, Mike Keltz, Rick Johanson, and Mark Howard received the NOAA Administrator's Award for the development of the NOAA Shoreline Data Explorer (NSDE) project. This project is the infrastructure that stores, serves, and disseminates all historical and contemporary shoreline vector data sets to all of its customers. The NSDE provides the centralized storage and immediate accessibility of all shoreline vector data through the Internet.

The original requirement was to store and distribute 13,000 historical shoreline vector data sets. The resultant NSDE is serving all shoreline vector data (historical, contemporary, and composite) and can easily serve other shoreline data such as raster images and text files. NSDE permits the organization to streamline its daily operations and produce contemporary data sets much quicker than before. It is also a Geographic Information System (GIS) tool that permits the Internet user to consolidate the vector data, customize queries for the data, and obtain dynamically generated FGDC compliant metadata for their retrieved data sets. The NSDE portal was awarded "Best GIS Tool" at the NOAA Tech Fair and has been presented at various conferences, including the Coastal Zone 2001, the NOAA Shoreline Change Conference and Coastal GeoTools '03 in Charleston, SC, and the ESRI User Conference '02.

Upcoming Events

July 1-2, 2003 - Coastal Restoration and Enhancement through Science and Technology - Thibadaux, LA

July 6-8, 2003 - Survey and GIS Summit - San Diego, CA

July 9-12, 2003 - National Society of Professional Engineers (NSPE) - San Antonio, TX

July 13-17, 2003 - Coastal Zone 03 - Baltimore, MD

Sept. 9, 2003 - ION GPS/GNSS 2003 - Portland, OR

NGS In the Field

Denny Hoar shows how to use a GPS receiver at NOAA's Bring a Child To Work Day 2003.

Davy Crockett supervises leveling near Virginia Beach.